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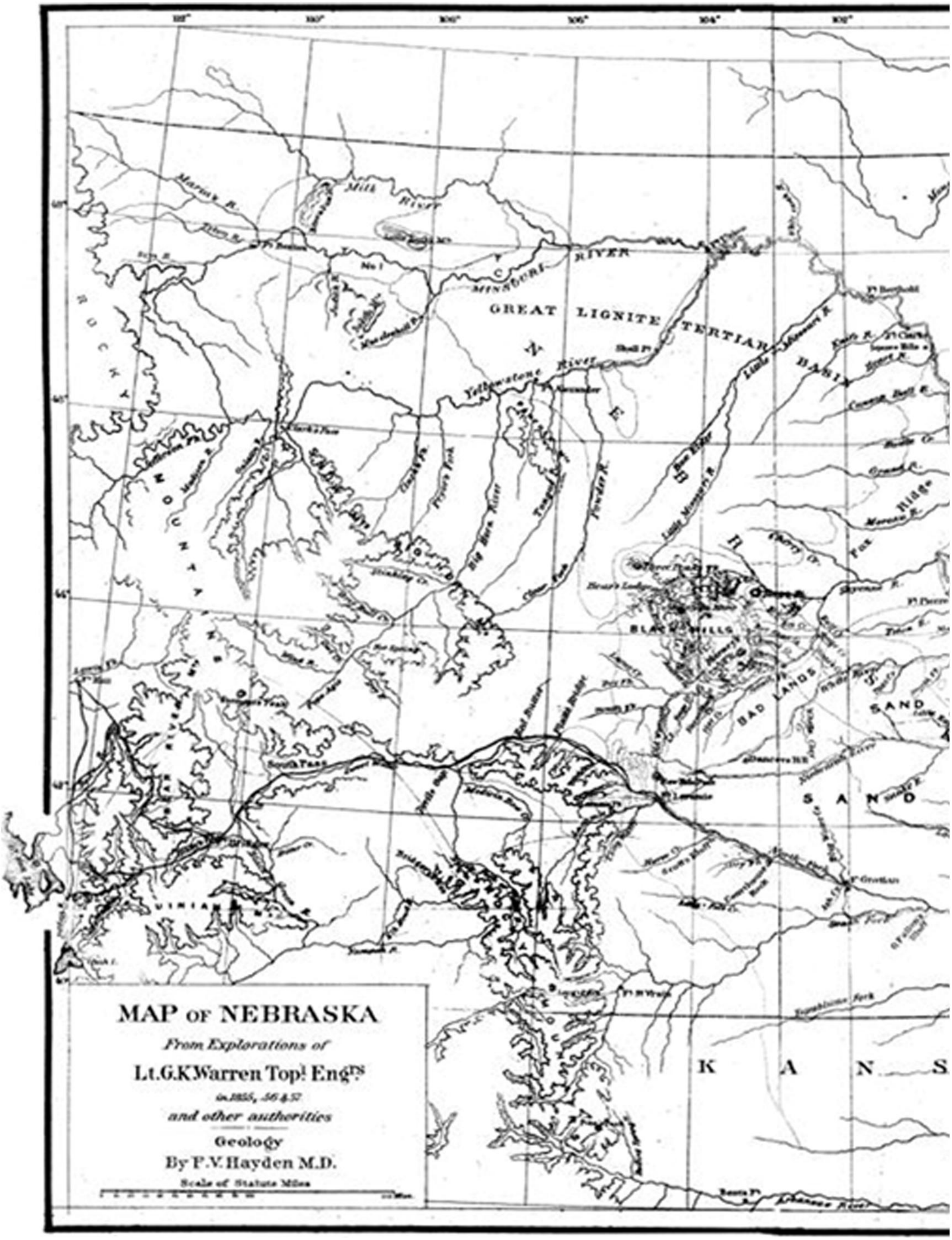


MAP OF NEBRASKA

From Explorations of

Lt. G. K. Warren Topl. Engrs.

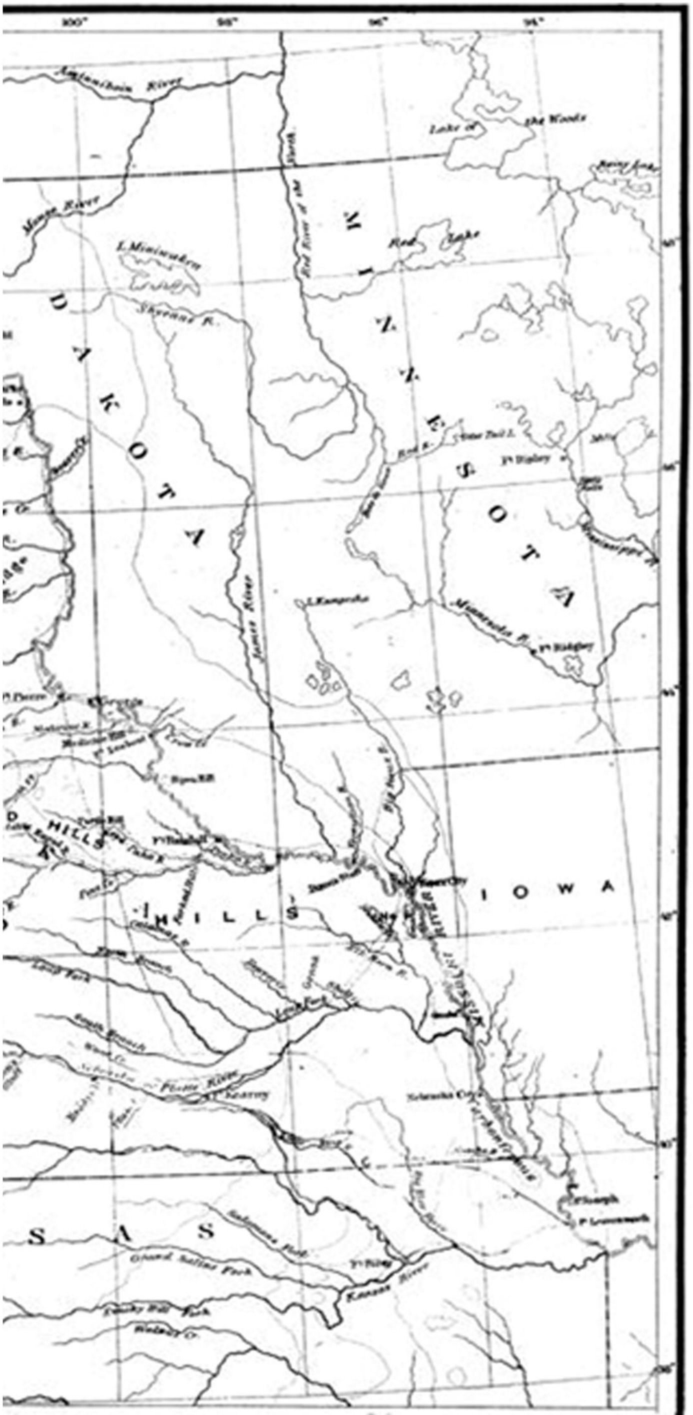
in 1855, '56 & '57

and other authorities

Geology

By F. V. Hayden M.D.

Scale of Statute Miles



Lith of J. Bien, 60 Fulton St. N.Y.

GEOGRAPHY AND RESOURCES OF NEBRASKA.*

Nebraska Territory, according to the Act of Congress of 30th May, 1854, is bounded on the north by the parallel of 49° north latitude; on the east by the White Earth and Missouri Rivers; on the south by the parallel of 40° north latitude, and on the west by the Rocky Mountains. Within these bounds is an area equal to 335,882 square miles.

Beginning with the main range of the Rocky Mountains on the 49th parallel, their eastern base has a direction nearly northwest and southeast—the range crossing the Missouri at the "Gate of the Mountains." Continuing southeast, it crosses the Yellow Stone near latitude 46°, immediately south of which it forms high snow-covered peaks. The range is again broken by the *Big Horn*, and the mountains adjacent thereto receive the name of that river. The southeast terminus of the Big Horn Mountains falls off into the elevated table-land prairie, and the range probably re-appears as the *Laramie* Mountains. South of the latitude of Fort Laramie, the line of the eastern front of the mountains is nearly north and south.

The Black Hills are the most eastern portion of what has heretofore been considered a part of the great mountain region west of the Mississippi; and it is worthy of note that if a line be drawn from them to the Little Rocky Mountains on the 48th parallel, which are the most eastern portion in that latitude, this line will be parallel to the line of the main front of the mountains already traced. What is still more significant is, that if a straight line be drawn from the mouth of the Yellow Stone to the mouth of the Kansas, it will also be parallel to the before-mentioned lines, and will have about an equal portion of the Missouri River on each side of it.

The eastern base of the main mountain mass is, of course, the highest of any portion of the plains, and at Raw Hide Peak, near Fort Laramie, its elevation is about 5,500 feet, as determined by the horizontally stratified tertiary deposits; though owing to great denudation, the average height there of the plains is not so great. The plain near the 49th parallel has probably an elevation somewhat less. The lowest line of the plains is that along the Missouri; and its elevation near Bijou Hills, (a point about on the perpendicular to it from Fort Laramie), is about 2,130 feet, which does not differ materially from its height at the mouth of the Yellow Stone. The slope of all this part of the plains, (being in a direction perpendicular to the lines of equal elevation,) has therefore its line of greatest descent in a northeast direction, and north of the Niobrara; and this is the direction in which a majority of the rivers flow, till they join with the Missouri or Yellow Stone. To the south of the Niobrara the greatest slope of the plains is to the southeast, towards the Gulf of Mexico, and this is the direction pursued there by nearly all the rivers of the plains. Thus the Niobrara would seem as it were to run along the surface of a high swell or ridge. The average slope of the plains from the Missouri to the mountains makes nowhere an angle greater than one-half of a degree with the horizon.

A remarkable feature in regard to the change of slope which occurs with the course of the Niobrara, is the shortness of its tributaries; the surface drainage seeming to be *from* and not *towards* it. A result of this is the absence of the amphitheatre-like valley which rivers generally present. Through the greater portion of the middle half of its course, the observer has scarcely any indication of it till within close proximity, so completely is it hidden by the precipitous bluffs which enclose it on either side. The surface drainage, says Lt. Warren, could never have been directed along its course so as to have worn out this channel. It must have originated in a fissure in the rocks, which the waters have since enlarged and made more uniform in size, and which the soft nature of the rock would render easy of accomplishment.

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* Reduced from Lt. G. K. Warren's "Explorations in Nebraska and Dakota," in the years 1855-56 and 57. Washington: 1859.

It is worthy of remark, in this connection, that the bed of the stream in long. 102° is 400 feet higher than that of the White River at the nearest point to this. White River having there cut its way entirely through the tertiary formation, flows along the cretaceous; while the bed of the Niobrara is in the miocene tertiary, the pliocene forming the bluffs. The bed of the Niobrara is also in two-thirds of its upper course, from 300 to 500 feet above the bed of the Platte River at corresponding points at the south.

In the section of the country through which the Niobrara flows, the soil is very sandy, so that whatever rain or snow falls, it sinks under the surface, so that little is lost by evaporation. This is gradually all poured into the stream by the springs in the ravines, and in this way the river is mainly supplied in the dry seasons, in which it is one of the largest streams of the territory.

The slope of the plains is a subject to which much attention has been attracted from its scientific as well as practical interest. On this point, the barometrical observations of Lt. W.'s explorations in some measure fill up the gap between those of Gov. Stevens on the north and Fremont on the south, and thus give connected levels over a very large area.

The observations upon the great tertiary formation have developed the fact, that since the close of the pliocene period, the eastern base of the mountains, which is the western limit of this formation, has been elevated from 2,000 to 3,000 feet above the eastern, and this, without there being any visible signs of upheaval, such as inclination of the strata. The only direct evidence is in the immense denudation which the tertiary has undergone, probably while this elevation was in progress, the causes of which must have been gradually exhausted, as there is at present no force at work sufficient to have effected it. The evidence goes to show that the elevation that has taken place since the close of the pliocene, has been in Nebraska remarkably uniform, and along a line in a general direction northwest and southeast, and nearly coincident with the ranges of the mountains previously upheaved.

The Black Hills received their last violent upheaval at the same period as the Laramie Mountains, that is, at the close of the cretaceous period. The geological evidence plainly exhibits that the pliocene and miocene tertiary, south of the Shyenne, are fresh water formations; yet there are no ridges now standing to mark the northern boundary of this basin. In the present relative position of the different parts of these plains, the elevation of the pliocene tertiary formation is now so distinct, that much of the Black Hills and the cretaceous on the Shyenne, should have been covered with it. This might, however, have been the case, but all is now denuded. North of the Shyenne, the cretaceous ridges are probably sufficiently high to have separated the tertiary beds south of it, from the lignite tertiary to the north. But still it is necessary to suppose that this last elevation of the tertiary has been somewhat greater near the 42d parallel than to the north of it.

A most interesting problem could be solved in regard to these changes of level, if a locality could be found where the lignite tertiary north of the Shyenne would be in contact with the pliocene or miocene beds to the south of it; as well as the more important one of the age of the first relative to the two latter.

During the time of these changes since the formation of the pliocene tertiary, the soft sandy material of which it was composed has been crushed and separated by denuding forces, and an area of no less than 20,000 square miles, called the *Sand Hills*, has been covered with barren sand, which, blown by the wind into hills, renders this section notoriously barren, and in a measure impracticable for travel. The Niobrara River, lying on a most desirable line of communication and direct in its general course, has 100 miles of its banks obstructed with these sand hills, and the communication of this stream and the Platte greatly obstructed, and in some places entirely cut off.

From what has been said it will be seen that the surface of Nebraska presents two great sections—one of plains, the other of mountains. The plains are composed of nearly horizontal strata of the tertiary and cretaceous formations, except in a small portion of the southeast corner where the carboniferous is developed. Though much diversified by the effect of denuding agencies, and presenting in differens portions striking characteristics, yet they on the whole present a pretty uniform surface, gradually rising towards the mountains, at the base of which they attain an elevation varying from 3,000 to 5,500 feet above sea level. These plains, as determined by their geological formation, and as heretofore intimated, have three distinct portions: 1st, the pliocene and miocene tertiary; 2d, the cretaceous, and 3d, the lignite tertiary.

The *first section* extends from the southern boundary north, nearly continuous to the 44th parallel, and contains a large portion of the valleys of the Platte, Loup Fork, Niobrara and White Rivers. Here, except in the immediate valleys of the streams, which are composed of good soil naturally irrigated by springs from the bluffs or susceptible of irrigation, much of the country is sandy and unfit for cultivation. No valuable mineral or good building stone have been discovered in it. Here are to be found the Sand Hills, which occupy an area north of the Platte of not less than 20,000 square miles. These hills on the north begin between the White and Niobrara Rivers, and extend south probably beyond the Arkansas. Their height, so far as ascertained, varies from 10 to 200 feet, and in the western portion they are ranged in ridges running east and west; but in traveling they are frequently crossed, as the intermediate valleys, which are also sand, are not continuous. About the sources of Loup Fork, many of the lakes of water found in them, are impregnated with salts and unfit to drink. The present form of these hills is mainly, if not entirely due to the wind. Where grass protects the surface the sand does not drift; but if this is removed, the wind whirls the sand in the air and often excavates deep holes. Thus it would appear that no road could be carried through this part of the territory; for should any attempt be made to grade the surface, the drifting sand would soon fill up the cuts. In this section is also to be found the *Mauvaises-Terres*, or *Bad Lands* of White River, so celebrated for their vertebrate remains. The locality to which this name has been applied is in extent about 150 miles long, in a direction northeast and southwest, and about 60 miles wide. The term was given to this section by the traders, on account of the difficulty of getting a road through a portion of it. The name, however, is an improper one to be applied to the whole of the geological formation, to which these *Bad Lands* belong; and ought not to be used except in speaking of the portion occupied by it along the middle course of the White River; and even in this part of the river's course some beautiful valleys are to be found, as beautiful as anywhere in the far west. These Bad Lands of the White River country have frequently been spoken of as a vast grave or sepulchre, from the amount of bones found there; and this figure of speech has somewhat tended to give a gloomy idea of the locality which it does not especially deserve, as it abounds in the most beautiful and varied forms, in endless variety, giving the most striking and pleasing effects of light and shade. It has also been described as a great depression in the plains, with the country rising like steps to the Black Hills; whereas many portions of these Bad Lands are higher than all the country between them and the mountains, from which the portions on White River are distant about 30 miles. The formation to which this portion belongs extends almost uninterruptedly east to the mouth of the Keya Paha, and south beyond the Platte; and an instance of the striking appearance which it sometimes makes, is exhibited in the Court-House Rock and Scott's Bluffs.

The *second section* is the cretaceous formation, forming the level country at the base of the Black Hills; the valley of the Shyenne River, and the immediate valley of the Missouri River, from Heart River to the Big Sioux. In this section the soil is clayey; and wherever there is a sufficiency of rain, or streams, to irrigate the soil, it is productive. The great drawback to its fertility is a want of timely rains. A portion of this formation from the Big Bend to the South Shyenne is composed of black shale, and contains much saline matter, which renders the water in some places unhealthy, and adds to the sterility of the soil along the bluffs of the streams, where saline springs are common. In this section, too, there are no valuable minerals or good building stone, except that furnished by boulders.

The *third section*, or lignite tertiary, extends north and west to the British line. The want of rain, which is experienced in this area even more than in the one north of it, renders it nearly barren. Everywhere beds of lignite are to be found, sometimes of a thickness of 6 or 7 feet. The burnt appearance of the earth, along the banks of the streams, shows that in former times these beds have been on fire over large areas, and in places are entirely burnt out; and those on Powder River are said to be on fire at the present time. There is, however, every reason to believe that in places this lignite will be found of quality good enough for fuel. In this section boulders furnish the only good building stone; but here, as in all other parts of Nebraska, good clay for making brick can be found.

The carboniferous formation is developed in a small part of the south eastern portion of the prairie of Nebraska. The town of De Soto is the highest point known on the Missouri where limestone is exposed. Ascending the valley of the Platte it is found quite well developed as far as the north of the Elk Horn, where it passes beneath the bed of the river, and become overlaid with sandstone. Several small seams of coal have been found in these limestones at Bellevue and elsewhere, and in the valley of the Platte; but it is evident that though these limestones belong to the true coal measures, they hold a position above the valuable beds; nor is it probable that a single valuable seam will be found north of the Kansas line. The coal wrought near Fort Leavenworth, in the Kansas Territory, holds a lower geological position than the limestones of southern Nebraska. The seam of very inferior lignite, near Sioux City in the cretaceous rocks, may possibly in some places furnish fuel of value, but when exposed it gives little promise of such a result. In this case, however, as well as the coal seams in the Platte, it may be, that on penetrating to the interior portions of those beds, they will improve in quality.

The section of Nebraska which is now being occupied by settlers, has fertile soil, not surpassed by any portion of the prairies of the Mississippi Valley. In this eastern section are found the fertile and wooded valley of the Elk Horn, and all the wooded parts of the Platte. In the southern portion of it good building stone is furnished by the carboniferous rocks.

After passing to the west of the 97th meridian, sandy tracts are met with, especially near the 42d parallel, upon which they have their greatest eastern extension. It is not to be assumed, however, that there are no good lands west of the meridian of 92°, for there are fertile tracts as far west as the 99th upon the borders of streams, and which contain wood enough to support settlements. But beyond this, to the mountains, the settler will have to depend for subsistence on his flocks and herds as the Indian now does on the buffalo. Good grass is generally found all over the plains, varying in quantity and quality with different localities. In this particular the plains of Nebraska differ essentially from the desert country on Green and Snake rivers west of the South Pass, where even a sufficiency of grass for animals cannot be found.

A very different condition of soil, water and building material of stone and wood exists on reaching the mountain region.

The Black Hills, or, more properly, mountains lying between the forks of the Shyenne on the 44th parallel, between the 103d and 105th meridians, cover an area of 6,000 square miles. Their bases are elevated from 2,500 to 3,500 feet, and the highest peaks are about 6,700 feet above the ocean. The different rocks composing these mountains are—

1. Metamorphosed azoic rock, including granite.
2. Lower Silurian, or Potsdam sandstone.
3. Devonian.
4. Carboniferous.
5. Permian.
6. Jurassic, and
7. Cretaceous.

All the rocks below the Silurian are igneous and metamorphic, and the stratification which they exhibit stands every where nearly vertical, with a strike varying between northeast and northwest. All the rocks, from the Silurian to the close of the cretaceous, apparently lie conformable to each other. The shape of the mass is elliptical, the direction of its major axis being north, about 20° west. On the west, the rocks dip as a whole very gently, and at a distance of five miles from the foot of the hills, the cretaceous is apparently undisturbed, though at the base, these rocks stand at an angle of 15°. The manner in which this rock lies, suggests the idea that the cretaceous probably forms a considerable portion of the elevated plateau between the Black Hills and Big Horn Mountains. The upheaved rocks form more than one-half the mountain mass, composing some very high ridges. These rocks have a much greater inclination on the east side of the mountains, and soon disappear under the cretaceous, forming a comparatively narrow belt. The east base of the mountains is from 2,000 to 3,000 feet below the western. The rocks seem also to dip much more suddenly on the south than on the north side. The strike of these upheaved strata is in almost every direction corresponding on the exterior nearly with that of the tangent to the outline of the mass, and on the interior more nearly coincident with the direction of the major axis. A result of this formation is, that the upturned rocks break off abruptly on the side towards the interior of the mass, and leave open valleys in many places between this steep slope and the gentle one which succeeds it, as the interior is approached. In these valleys, the best roads are found, and one which nearly encircles the Black Hills, is known among the Indians and traders, as the Race Course, or Running Road.

The Black Mountains derive their name from the dark appearance of the pine forests by which they are covered. The highest masses in the east, at Harney's Peak, are all granitic, and, as seen at a distance, appear in the same unmistakeable form as those on the Raw Hide and Laramie Peaks; the rocks standing in layers and slabs, indicating a vertical stratification. The Inyan Kara Peak is basaltic, as are also, from distant appearances, the peaks to the north known as the Bear's Lodge and Little Missouri *Buttes*. More recent volcanic action is visible at Bear's Peak, and two circular spaces to the west of this peak, now occupied by muddy lakes, indicate the existence here, in former times, of volcanic forces.

In these mountain formations, which border the great plains on the west, are to be found beautiful flowing streams, and small rich valleys, covered over with fine grass for hay, and susceptible of cultivation by means of irrigation. Fine timber for fuel and lumber, limestone and good stone for building purposes are here abundant. Gold has been found in places in paying quantities, and, without doubt, the more common and useful minerals will be discovered when more minute examinations are made.

It is exceedingly desirable that something should be done to encourage settlements in the neighborhood of Fort Laramie. The wealth of that country, says Lieut. Warren, is not properly valued. Those who live there now support themselves by trade with the Indians, which being already overdone, it is to their interest to keep others away. If the Indian title were extinguished, and the protection of the territorial government extended, there would soon spring up a settlement that would rival that of the Great Salt Lake. The Laramie river is a beautiful stream, with a fine fertile valley and there are such everywhere along the base of the mountains. Pine timber of the finest quality is found in abundance, easy of access, and from which the finest lumber can be made; and building stone of good quality abounds. The establishment of the military post at Fort Laramie, and the constant passing of emigrants, have driven away the game, so that the Indians do not set a high value on the land, and it could be easily procured from them.

The people now on the extreme frontiers of Nebraska are near the western limits of the fertile portions of the prairie lands, and a desert space separates them from the fertile and desirable region in the western mountains. They are, as it were, on the shore of the sea, up to which population and agriculture may advance and no further. But this gives them much of the value of places along the Atlantic frontier, in view of the future settlements to be formed in the mountains, between which, and the present frontier, a most valuable trade would spring up. The western frontier has hitherto and always will be looking to the east for a market; but as soon as the wave of emigration has passed over the desert portion of the plains, to which the discoveries of gold have already given an impetus, then will the present frontier of Kansas and Nebraska become the starting point for all the products of the Mississippi Valley which the population of the mountains will require. The beneficent operations of this trade are foreshadowed in the Santa Fe trade now carried on from the western border of Missouri; and still more plainly in the impetus given to Leavenworth by its being the depot for the supply of the army in Utah. This flow of products has in the last instance been only in one direction, but when those mountains become settled, as they eventually must be, then there will be a reciprocal trade materially beneficial to both.

These settlements in the mountains can never be agricultural to the same extent as those of the Mississippi Valley, but must depend greatly upon the raising of stock. The country, however, furnishes the means of raising sufficient quantities of grain and vegetables for the use of the inhabitants, and beautiful, healthy and desirable locations for their homes. The remarkable freedom here from sickness is one of the attractive features of the region, and will in this respect go far to recompense the settler from the more fertile valley for his loss, in the smaller amount of products that can be taken from the soil. The great want of suitable building material, which now so seriously retards the growth of the west, will not be felt in this region.

How far the fine timbers in the interior of Nebraska can be relied upon to supply settlements on the Missouri is a question as yet undecided. The pine extends along the Niobrara and its side ravines for about 120 miles, and there is nearly an equal extent of it on White River; but on both streams it is of inferior quality and difficult of access. That at the Black Hills is much better, and covers an area of about 1,500 square miles; but this is also in situations where much labor would be required in getting it out, and an Indian war would probably attend the first attempts to do so. The Niobrara, White and Shvenne rivers could be used to bring the logs to the Missouri, down which they could be rafted.

With regard to the climate of Nebraska a true indication is to be found in the character of the plants which flourish within its limits. Certain kinds, unable to survive the long periods of drought which occur, though appropriate to the latitude, are rarely to be seen, and those which flourish best are such as require little moisture, or whose roots, penetrating deep into the soil, enable them to draw a sufficiency of moisture from below. In the high prairies, where there is a good soil, the *bunch* grass abounds, but in many places is interspersed with patches of *cacti*. The bottom lands of many of the streams support no trees, except the cottonwood and willow, and some of them produce rank growths of the wild sage.

The absence of trees on all the prairie regions is another evidence of the dryness of the climate, and even in places where they are formed, as in the ravines, the excessive cold of the winter winds prevents them from reaching their full development, as is proved by the dead tops of nearly all the trees which extend their branches above the level of the prairie. The prairie fires have indeed done much towards preventing the growth of trees in places adapted to them, but it is not a sufficient cause to account for the general absence of forests.

An interesting instance of the effect of the climate in the growth of trees is to be seen in the cedar, on ascending the Missouri. At the first Cedar Island, in lat. 43°, these trees grow in the bottom lands of the river, and are large and straight; those growing on the bluffs being of an inferior quality. Further up the stream the trees diminish both in size and number. The last considerable clump or grove is in the bluffs, opposite the mouth of the Little Shyenne, in about lat. 45°; and here they are exceedingly crooked and twisted. Along the Missouri and Yellow Stone, in the lignite tertiary formation, we find the cedar unable to support itself above the ground, and spreading itself over the surface, presents the appearance, on the hill sides, of grass or moss.

Grass is everywhere abundant. With regard to corn, a small variety is raised by the *Mandans*, *Rees* and *Gros-Ventres*, near the 47th parallel on the Missouri; and it is probable that this corn can be raised along the base of the mountains as far north as the 46th parallel. The entire mountain section will produce good wheat, where the land can be irrigated; and the abundance of grass for pasturage will permit of the raising of immense herds of cattle. This western portion of Nebraska may, therefore, in the future, be valuable for a people partly engaged in agriculture, but relying mainly upon the raising of stock.

Of the rivers of the Territory, the Missouri claims first attention. This great stream has generally an uniform width from the junction of the Yellow Stone to its mouth, varying from a third to half a mile, when the banks are full. In low water the width is much less, and dry bars of sand occupy portions of its bed. In the upper part of the river, where the trees do not destroy the force of the wind, the sand is blown about in a surprising manner, and the clouds of it can be seen for many miles. Sand banks are thus formed, generally at the edges of the trees on the islands and points, and which are often raised many feet above the level of the highest floods. The force of these winds, and their constancy during certain months, especially in October, are of themselves one of the greatest obstacles to the navigation of the river.

The navigable qualities of the river are pretty uniform from the mountains to its mouth; the difference being a little more depth of water below James' River. Along the banks, the bluffs are generally clothed with various species of trees as far up as the mouth of the Platte; above which the timber is usually confined to the ravines and bottom lands. These bottoms attain a width of from 10 to 15 miles at Council Bluffs. This width is almost continuous to the mouth of James' River. Throughout this section, the edges of the banks are lined with heavy cottonwood and other trees, and fuel for steamboats is cheap and abundant. At James' River the bluffs approach so closely, that the general width of the space between is only from one to two miles all the way to the upper Big Bend, near the 48th parallel. Here again the bottom lands become wider, and preserve a width of from 3 to 6 miles, to a point about 50 miles above the Yellow Stone. In this section there is also an abundance of large cottonwood timber, and the appearance of the river is quite similar to that presented at Sioux City. The portion of the river most deficient in wood is that between the mouths of the Little Shyenne and Cannon Ball rivers; but even here, there is an abundance for the purposes of navigation for years to come.

Another great obstruction to navigation, is the great number of *snags*, or trees, whose roots, imbedded in the channel, stand at various inclinations down the stream. These obstructions are comparatively rare above the mouth of James' River, but from this point down, they are so extremely numerous that boats are compelled to lay up, during the night, and thus occasion a loss of nearly one-half of their running time. These and adverse winds delay steamers for days. The effect of the wind is much more seriously felt above Council Bluffs, for the protection afforded by the trees on the banks is less, and is constantly diminishing.

The examinations of Lieut. W.'s party extended only sixty miles above the Yellow Stone. The portion of the river above that point, however, was thoroughly examined by Gov. Stevens in 1853. From these examinations it has been ascertained that the river is navigable in its best stages for light draught boats to Fort Benton, about 2,600 miles from its mouth, and it is the opinion of Lt. W. that notwithstanding the difficulties to navigation which exist, that the Missouri is superior to any river in this country, except that portion of the Mississippi below their junction. The navigation is generally closed, by ice, at Sioux City, by the 10th November, and at Fort Leavenworth by the 1st December. The rainy season commences in different years, between May 15th and June 30th, and lasts about two months During this period the tributaries of the Missouri maintain it in good boating stage. The flows produced by the melting snows come from the Platte, Big Shyenne, Yellow Stone, and the Missouri above the Yellow Stone, and reach the lower river about the first part of July, and it is mainly to these that the navigation of the Missouri above the Niobrara depends.

The American Fur Company's boats are of the largest class of freight boats now navigating the Missouri. They carry from 150 to 200 tons to the Yellow Stone, 1,900 miles, drawing from 3 to 3½ feet of water, and making the passage up in from 22 to 35 days. Considerable freight is taken out for the post of Fort Union, and they generally ascend with the portion destined for Fort Benton, to about 60 miles above the Yellow Stone, and have on one occasion gone to Milk River, 100 miles further. The freight is now taken on board of Mackinac boats, and cordeled by hand, aided generally by sails. These boats are from 60 to 70 feet long, drawing 15 to 18 inches, but 20 to 24 inches could be used. The time from Fort Union to Fort Benton varies from 40 to 80 days, depending on various causes, of which the wind is the most important. The river distance from Milk River to Fort Benton is 500 miles.

The Yellow Stone enters the Missouri near Fort Union. For the first hundred miles above its mouth the bottom lands are nearly all on the left bank; and the first 40 miles, are from 4 to 5 miles wide, with beautiful, soft, rounded bluffs to the west. The banks are clothed with large cottonwood trees, and the country presents one of the finest locations for a military post, and an Indian reservation, anywhere to be found. Beyond, the bluffs on the left bound the approach almost to the water's edge, the bottoms are narrowed, and the timber smaller and more scanty. A good route for wagons, however, exists on this side for 100 miles above the mouth. Beyond this point, the route becomes obstructed by impracticable bluffs, barely permitting the passage of pack mules. To pass around them with wagons without crossing the Yellow Stone, a detour has to be made into the prairie, consuming one or two days. Bluffs similar to these exist on the right bank all the way from the mouth to this point, but here the river suddenly changes its position in the valley, so as to leave the open space on the right bank.

This point is also the highest in the reach of navigation for steamboats, and those even of very light draught cannot, except at high water, ascend higher than 50 miles from its mouth, as the channel is much cut up by wooded islands, and obstructed by sand bars. At the head of steam navigation, ledges of rock show themselves in the bed of the streams, and about one-half mile below Powder River, a dangerous rapid, called by Captain Clarke, *Wolf Rapid*, is encountered. Two miles above the Powder River, Captain Clarke describes another serious interruption, in Bear Rapid, and 20 miles above this another which he calls Buffalo Shoal, "the most difficult part of the Yellow Stone River." All these rapids are passed every year by the

Mackinac boats of the Fur Company on their way to Fort Alexander Sarpy, and there are probably no obstacles sufficient to prevent them from reaching the point where this river debouches from the mountains. The valley all the way to the mountains is said to be practicable for wagons. Above this point the river is much enclosed by mountains, which are rugged and difficult, and covered with pine forests. From Fort Union to Fort Alexander Sarpy, the boats are from 50 to 60 feet long, drawing 15 to 20 inches water, and make the distance, 225 miles, in from 15 to 30 days.

None of the tributaries of the Yellow Stone, (Clark's Fork, Big Horn, Tongue, and Powder Rivers,) above their mouths, have ever been visited, except by trappers and hunters. Big Horn is the most important of these, and has been navigated by traders in skin boats, carrying peltries from the point where it debouches from the Big Horn Mountains, to the main river, a distance of perhaps 150 miles. Powder River rises near the southern point of the same mountains, and flows a little east of north. A route from the Platte, (at Red Buttes,) to the Yellow Stone along the stream is practicable; but, as a route for wagons, it is difficult, requiring the stream to be frequently crossed. Its banks are very muddy, and the bed in places is quicksand.

The Little Missouri River rises in the northern part of the upheaved stratified rocks of the Black Hills, and has a general northeast course through the great lignite region, to the Missouri. Sir G. Gore's party traveled up this river in 1856, and hence it is inferred that a wagon route along its border is practicable, though it may be difficult. The valley is one of the great buffalo regions. The Knife Heart, Cannon Ball, Grand and Moreau rivers all rise in the prairie ridge, east of the Little Missouri, but contain little water, except in the rainy season. The Big Shyenne is an important stream, and has its extreme sources west of the Black Hills, which its two main constituents enclose. These are supplied by numerous streams from the mountains, and unite in long. 102° 20′, the river reaching the Missouri in lat. 44° 48′. In its lower course there is fertile land on its banks, and also to a large extent in and around the Black Hills. Lumber can, probably, be floated down this river, and the streams that flow into it. The Missouri, at the mouth of the Shyenne, is in the centre of the Dakota country, and along its valley we have the shortest and best route by which to reach their strongholds. Bad River, (Wakpa Spicha, or Teton,) receives its name from the unpalatableness of its waters in low stages, and the difficulty of traveling along it in wet weather. It lies throughout in the black shale bed of the cretaceous formation. It is along the sources of its northern tributary that the road from Fort Pierre to Fort Laramie is located. White River,(Mankisita Wakpa) has generally an open, well-wooded valley, with a fine soil and luxuriant grass. The road between Forts Laramie and Pierre follows the valley from its source to the Bad Lands, where the river enters a difficult section, bounded with precipices, like those on the Niobrara. The Bad Lands extend continuously down the stream to the South Fork, a distance of about 70 miles. Below this the river winds through a handsome, well-wooded valley to the Missouri. It has numerous branches, the largest of which is the South Fork. The pine in this river is nearly equal in extent to that on the Niobrara. This stream has been used by the traders to float down their peltries by means of skin-boats from their former trading house, near Butte Cache, and can also be used to raft down the pine lumber on the South Fork.

The Niobrara is a river about 350 miles long. From its source, in long. 103° 15′, it is a beautiful clear stream, 10 to 15 feet wide, gradually widening, until, in long. 102° 30′, it attains a width of 60 to 80 yards. All this distance its valley is well grassed, quite open and easy of travel. Here, however, it enters high steep banks, and for a long way it is a complete canon; but wood now becomes more plentiful, and pine is occasionally seen on the bluffs. In long. 101° 45′, the sand hills close in on the north bank, while on the south, they are two miles distant, leaving a smooth road to travel along the bluffs. The bluffs gradually appear higher and higher above the stream, as it descends until they reach the height of 300 feet. The sand mostly ceases on the north side in long. 100° 23′, but it lies close to the stream in the south, nearly all the way to the Wazihonska. Throughout this section, lying between 102° and 99° 20′, it flows between high rocky banks of soft white and yellowish calcareous and silicious sandstone, standing often in precipices at the water's edge, its verticality being preserved by a capping of hard grit. It is here impossible to travel any considerable distance along its immediate banks without having frequently to climb the ridges which rise sometimes perpendicularly from the stream. The channel appears to have resulted from a fissure in the earth's crust, and now flows at a depth of 300 feet below the general level, and on approaching it, its existence is only heralded by the trees which overtop the enclosing bluffs. The soft rock, which forms the bluffs, is worn into the most intricate labrynths by the small streams; and in the small deep valleys thus formed, the grass is luxuriant, and pine, ash and oak abundant. To the agriculturist, however, this section has comparatively little attraction. That between long. 99° 20′ and its mouth, an extent of about 90 miles, is perhaps far more valuable. Here the bottoms will probably average a width of a quarter of a mile, are susceptible of cultivation, and cottonwood, oak, walnut and ash abound. The principal tributaries of Niobrara, (which are described at length by Lt. W.,) are the Turtle Hill River (Keya-Paha Wakpa), the largest, and perhaps 120 miles long; Little Rapid River, (Mini-chaduza-Wakpa,) about 50 miles long, and forming the eastern border of the sand hills, and a number of minor streams from the northwest. Entering from the south, streams are numerous, but only three of any size, being at most only 35 miles long. The bluffs along nearly all of these are well wooded. The Ponka River, which has a very fine, well wooded, and fertile valley, runs into the Missouri, about five miles north of the Niobrara, in lat. 42° 48′.

The Platte, or Nebraska, is the most important tributary of the Missouri in the region under consideration, and its broad and grass covered valley, leading to the west, furnishes one of the best wagon roads of its length in America. From its mouth to the forks the bluffs are from two to five miles from the water, making an intermediate bottom of from 4 to 8 miles wide. From the forks to Fort Laramie they occasionally come down to the water's edge, and the road has to cross the points of the ridges, and from Ash Hollow to the Fort the road is sometimes heavy with sand. Fine cottonwood grows along the banks, and on the islands from the mouth to Fort Kearny, but higher up it is scarce and of small size. Cedar is found in the ravines of the bluffs at the forks and above. The river is about a mile wide, and flows over a sandy bottom. When the banks are full, it is about 6 feet deep throughout, having a remarkable level bed; but it is of no use to navigation as the bed is so broad that water seldom attains sufficient depth, and then the rise is of short duration.

The streams of the prairies of Nebraska, below the Yellow Stone, flowing into the Missouri, are none of them navigable to any reliable extent; and, as most of them run from west to east, their greatest practical value is in affording the land route of communication between the two great sections of the Union. These valleys, indeed, furnish the only routes by which to traverse the intervening desert, for here only are such supplies of water to be found as are required, and here, too, is the only soil that can be cultivated, and such scanty supply of wood as the region produces.

Of all these river valleys, that of the Platte undoubtedly furnishes the best route for any kind of road, westward; and the best point of starting is the vicinity of Omaha City. An appropriation of $50,000 has already been expended in bridges, etc., on the eastern portion of it, and the only important improvement remaining to make it far superior to any route on the south side of the Platte is the establishment of a good crossing at Loup Fork, either by bridge or ferry, both of which are difficult: the first on account of the width of the stream (1,000 yards), and the latter on account of the shoals and shifting sand bars. The ford is bad by reason of quicksands. No improvement in the west would be of greater value to the emigrant or to military operations; and this once done, the route would not only be the shortest, in this latitude, from the Missouri to the mountains, but would not throughout have a serious obstacle all the way to the South Pass. Any route that takes the south side of the river has the South Fork, (which is as difficult a stream as Loup Fork,) to cross at a point where bridging it or establishing a ferry is as this time impracticable. The value of Omaha City as a starting point, as before recommended, is predicated on the improvements being made of the crossing of Loup Fork. At present Nebraska City is a point presenting almost as short a road. A considerable distance of river transportation would also be saved to stores brought from St. Louis, by selecting Nebraska City; and besides, this city must always be a superior point from which to supply Fort Kearny. The distance from Nebraska City to Fort Laramie, by the proposed improved route, is about 525 miles; from Fort Leavenworth to the same point it is 645 miles.

The first place which apparently offers a superior route to the last named is the neighborhood of Fort Randall. The distance to Fort Laramie is about 380 miles. There are two reasons, however, why this advantage in distance is not practically attainable—first, Fort Randall as a depot for supplies is not to be compared with Nebraska City; and, second, the greater difficulties of the route from Fort Randall west. That it is practicable to take wagons along the Niobrara has been already shown. The route east to Sioux City might be used for the hauling of supplies from the settlements of Iowa. This route, and that by the Niobrara, would indeed seem to be the most direct one by which to continue the military road from Mendota to the mouth of the Big Sioux, and westward to the South Pass. But the great difficulties of the Niobrara route, and the impracticability of any between it and the Platte, determined Lt. W. to advise its location direct from Sioux City to the mouth of Loup Fork, and the road this way, and thence along the Platte Valley, will be only about 40 miles longer than by the way of the Niobrara.

The next point on the Missouri which claims attention, as one from which to supply Fort Laramie, is the vicinity of old Fort Lookout. A route from this point should keep north of the White River, and intersect the present road from Fort Pierre to Fort Laramie. Except for about 30 miles through the Bad Lands, the line is excellent, and, with little improvement, would be equal to the corresponding part of the Fort Pierre and Laramie route.

The route west of this would then be the excellent one along the White Valley, at the head of which, however, there is a difficult section of about 12 miles, which needs considerable improvement. This route would be about 360 miles long, and deserves especial consideration as being the proper continuation of the route located between the Missouri and Fort Ripley, with the design of being continued to the South Pass.

The route from Fort Pierre to Fort Laramie is one that has long been in use, and is about 323 miles long. As settlement advances up the Missouri and Nebraska,and Iowa and Dakota become populated, this route or the one starting from Fort Lookout will claim attention.

At Fort Pierre the navigable portion of the Missouri is at its nearest point to Laramie and the South Pass, and above it, of course, there are no competing routes for supplying this section. Neither does the nearest navigable point for steamboats on the Yellow Stone, or its tributaries, offer any route, the shorter length of which would compensate for the increased river transportation.

In considering of the best routes for supplying the interior, the present wants of the country have alone been kept in view. When the habitable portions of Nebraska become occupied, other routes will become important from causes not now operating, and that cannot be foreseen; but, nevertheless, those which are now most important will still maintain the ascendency from the effect of natural causes, and the structure of the country. The same routes now most used, and best adapted to the wants of military occupation, were long before used by the trader, the Indian and the buffalo, as best adapted to their wants; and when future requirements shall demand increased facilities, and railroads shall be built, then they too will be found near the main routes now traveled by the trains of the emigrant and the army.

As before stated, an irreclaimable desert of 200 to 400 miles in width separates the points capable of settlement in the east from those on the mountains in the west. Without doubt these mountain regions will yet be inhabited by civilized men, and the communication with the east will require railroads independent of an interior overland route to the Pacific. For this purpose the valley of the Platte offers a route not surpassed for natural gradients in the world, and very little more is to be done west of the Missouri than to make the superstructure. A cheap road for light trains and engines could easily be built, and when settlements are formed in the mountains such will become profitable; and the gold that has been discovered there in valuable quantities may produce this result much sooner than is anticipated. The Niobrara apparently presents the shortest and more direct route for such a road, than the Platte, but, as before stated, its natural features are less favorable. Nevertheless, the Niobrara route is not impracticable, but the difficulties in the way will overbalance the advantages it possesses in being the shorter route from the Missouri. If the route be considered as starting at Chicago, thence *via* Rock Island, Omaha and the Platte Valley, the distance is about the same as that by Dubuque, Sioux City, and the Niobrara, the one large bend which the Platte route makes at Fort Kearney being counterbalanced by the number of smaller ones of the Niobrara route. A route for a railroad to the Pacific, from the neighborhood of St. Paul by way of the South Pass, would keep on, or near, the general course of the wagon road lately laid out to the Missouri at Fort Lookout, and thence along the north side of White River, as before indicated.

Should a route ever be required from the west shore of Lake Superior to the South Pass, it could be located on a very direct and practicable line, *via* Fort Ripley, Lake Traverse, and the Big Shyenne, and deserves examination.

But a route from Lake Superior to the South Pass would probably not compete with that examined by Gov. Stevens, near the 44th parellel. It may, however, be questionable whether one of equally as many advantages could not be found by preceding directly west from the Bois de Sioux to the Missouri at Fort Clark; thence by way of Knife River to the Yellow Stone, at the mouth of Powder River. The valley of the Yellow Stone thence offers a direct route west to the mountains, where Captain Clark crossed them, and thence near the route he pursued to the Bitter Root Valley. The more direct route would be down the valley of the Salmon River; but the information possessed of this stream indicates its character, through the mountains, to be one involving great difficulties.

The number of Indians within the limits of Nebraska, so far as enumerated by Lieut. W. would appear to be about 40,000. Of these the most numerous are the Dakotas, numbering 24,000; the Crows about 4,800, the Pawnees about 4,000, and the Chippewas, Crees and Assiniboins, about 3,600. The chapter relating to these is full of interest, but too long for insertion, after the extended notice given to the physical and economical features of the country. For the same reason the medical report of Dr. Moffitt, and the report of Dr. Hayden on its geology and natural history, etc., are omitted.

The subject of a railroad to the Pacific, being an abridgement of the explorations made by the government to this end, will form an appropriate continuation of this report.